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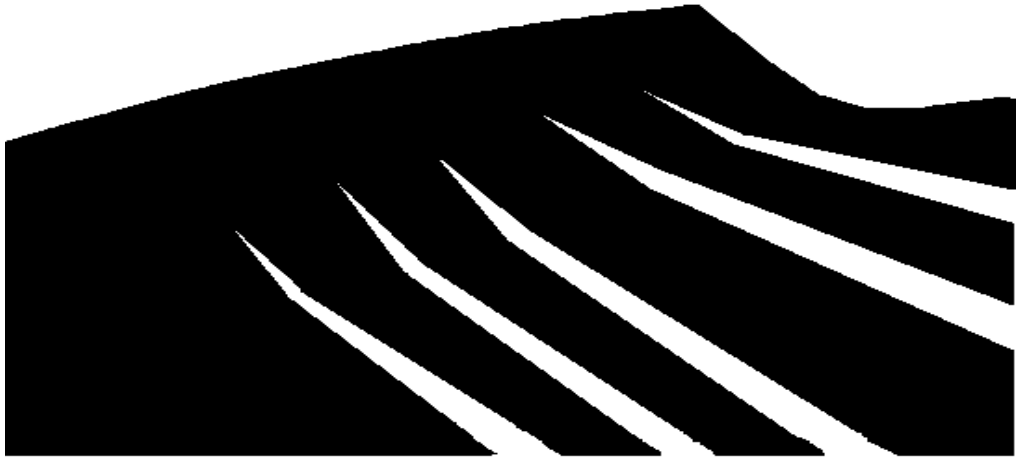
BALANCE AND WEIGHT CALIBRATION BY LANL STANDARDS AND CALIBRATION GROUP

LOS ALAMOS
QUALITY PROGRAM



APPROVAL FOR RELEASE	
J. YOUNG - PREPARER Signature on file	DATE
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M. J. CLEVENGER - QUALITY ASSURANCE PROJECT LEADER Signature on file	DATE

Los Alamos
Yucca Mountain Site Characterization Project

HISTORY OF REVISION

REVISION NO.	EFFECTIVE DATE	PAGES REVISED	REASON FOR CHANGE
R0	02/28/92	N/A	This procedure supersedes TWS-EES-13-DP-601, R0.
R1	08/02/93	Att. 1, page 2	Minor change to provide traceability between pages 1 and 2 of Attachment 1.
R2	12/18/95	All	Revised to reflect current calibration practices.
R3	12/10/96	All	Revised to comply with LANL-YMP-QP-06.3 requirements.

BALANCE AND WEIGHT CALIBRATION BY LANL STANDARDS AND CALIBRATION GROUP

1.0 PURPOSE

This detailed technical procedure (DP) describes a method by which the Los Alamos National Laboratory (Los Alamos) calibration group calibrates laboratory weighing devices (balances and scales) and mass standards (weights).

2.0 SCOPE

This procedure applies to calibrations performed by the Los Alamos Standards and Calibration group on laboratory balances and scales and weights at Los Alamos for Yucca Mountain Site Characterization (YMP) activities. Verifications performed by an operator or custodian are not addressed in this DP.

3.0 REFERENCES

LANL-YMP-QP-02.7, Personnel Training
LANL-YMP-QP-12.3, Control of Measuring and Test Equipment and Standards

4.0 DEFINITIONS

4.1 Calibration

Calibration is the process of certifying measurement and test equipment utilizing standards traceable to national standards and / or accepted fundamental physical constants.

4.2 Calibration Certificate

A calibration certificate is a document provided by a supplier of calibration services that attest to accuracy of the calibration, specifies the period of calibration validity, and indicates the traceability to the calibration standard.

4.3 Linearity

Linearity is the proportional change when given inputs are applied over the range of the measuring and test equipment.

4.4 Measuring and Test Equipment (M&TE)

M&TE is a device or system used to calibrate, measure, gage, test, or inspect physical or chemical properties of materials for the purpose of collecting data,

for establishing characteristics or values not previously known, or for verifying conformance to specified requirements.

4.5 Standard

A standard is material with known values, physical constant, or a device which is the reference for standardizing the output of M&TE or other standards.

4.6 Verification

Verification is the process of using standards to verify the output of M&TE.

5.0 RESPONSIBILITY

The following personnel are responsible for the activities identified in Section 6.0 of this procedure.

- Metrologist
- Custodian

6.0 PROCEDURE

The use of this procedure must be controlled as follows:

- If this procedure cannot be implemented as written, YMP personnel should notify appropriate supervision. If it is determined that a portion of the work cannot be accomplished as described in this QP, or would result in an undesirable situation, that portion of the work will be stopped and not resumed until this procedure is modified, replaced by a new document, or the current work practice is documented in accordance with QP-03.5, Section 6.1.6.

- Employees may use copies of this procedure printed from the controlled document electronic file; however, employees are responsible for assuring that the correct revision of this procedure is used.

- When this procedure becomes obsolete or superseded, it must be destroyed or marked “superseded” to ensure that this document is not used to perform work.

6.1 Principle

The minimum requirements for the control, calibration, and adjustment of balances, scales, and weights are defined to assure that the technical requirements are met. The objective is to determine functionality and accuracy of a device or standard (verification) and to adjust or repair (calibration).

6.2 Equipment and Hardware / Software

Primary weight(s) used in this procedure must have accuracy's and tolerances traceable to NIST calibrated weight set(s) in the appropriate range for the balance, scale, or secondary weight(s) that are to be calibrated.

6.2.1 Equipment Malfunctions

The activities described in this procedure will determine any equipment malfunctions.

6.2.2 Safety Considerations

The activities described in this procedure do not require any special safety considerations other than the Environmental Health and Safety requirements that are utilized in each different lab.

6.2.3 Special Handling

Primary weight(s) and secondary weight(s) will be handled with gloved hands. The weights should be wiped with a lint free dry cloth after use to minimize the collection of dirt and grease.

6.3 Preparatory Verification

6.3.1 Hold Points

The verification / calibration process is performed twice, once before and once after adjustments are made. If no adjustments are made, the post adjustment measurements are not necessary and a specific note attesting to that fact should be recorded on the Calibration Certificate (Attachment 1).

Do not proceed with the calibration if serious problems are detected, or if the specified tolerance of the equipment can not be obtained. A note attesting to that fact should be recorded on the Calibration Certificate. The **Custodian** performs the requirements stated in QP-12.3 subsection 6.5.

Before using any weight set(s), the metrologist inspects them for obvious damage that may alter their calibration. Any damaged weight(s) should be labeled, tagged, or otherwise identified as not useable until their accuracy is verified.

6.3.2 Calibration

Weight set(s) to be used for calibrating other weight set(s) or balances must be controlled pursuant to QP-12.3.

6.3.3 Environmental Conditions

Observe factors which may be detrimental to good weighing, such as dust, vibrations, air drafts, temperature fluctuations.

Secondary weight set(s) to be calibrated are placed in the same room as the primary weight set(s). This is to allow the temperature of both weight sets to approximately equilibrate. The actual temperature is not critical just that the weights are in equilibrium.

6.4 Control of Samples

No samples are used in this procedure.

6.5 Implementing Procedure

6.5.1 Calibration of Balances

6.5.1.1 Environment

Determine if there are any factors that may be detrimental to good weighing, such as dust, vibration, air drafts, or temperature fluctuation. If a detrimental condition exist, correct it if possible, or contact the equipment custodian.

6.5.1.2 Appearance

Observe whether the balance or scale is damaged or in need of repair. A decision is made to repair or replace and the action taken is noted on the Calibration Certificate. Further disposition is done in accordance with QP-12.3, subsection 6.5.

6.5.1.3 Balance Level

For balances with built-in levels, observe whether the balance or scale is level. If out of level, correct with adjusting screws.

6.5.1.4 Special Conditions

For balances and scales contained in glove boxes, weights and the apparatus used to adjust the equipment is provided by the Custodian. The **Custodian** must replace the glove box weights prior to their expiration of calibration due date.

6.5.1.5 Verification of Linearity

To verify the linearity, at least four weights are needed, with each or combination of each set corresponding to one-fourth, one-half, three-quarter, and full capacity of the balance range.

With no load on the balance, zero the balance. Place first test weight(s) on the pan and record the indicated value. Remove first test weight(s) and place second test weight(s) on pan and record the indicated value. Continue with third and forth test weight(s).

NOTE: If adjustments are made, verification of linearity is performed after the adjustment (post calibrations).

6.5.1.6 Adjustments

To adjust the linearity of a balance, the manufacture's specification are to be followed. Any balance or scale that cannot be adjusted to meet the manufacture's certification limits will be recorded as such on the Calibration Certificate. Further disposition is done in accordance with QP-12.3, subsection 6.5.

6.5.1.7 Documenting the calibration

The following information is recorded on a Calibration Certificate:

- unique identification number
- location
- date calibrated
- date due for re-calibration
- variation in mass from linearity
- tolerance
- calibrators name

6.5.1.8 Balance Labeling

For balances that are calibrated within the specified tolerance, the **Metrologist** completes an appropriate calibration label that contains as a minimum the following:

- M&TE identifier
- date that it was last calibrated
- next calibration due date

6.5.2 Calibration of Weight Set(s)

6.5.2.1 Before checking weights, the **Metrologist** inspects both primary and secondary weights for obvious damage that may affect the calibration. Any damaged weights should be labeled, tagged, or otherwise identified as not usable until corrected.

6.5.2.2 The **Metrologist** selects a balance to be used for the weight calibration that has a minimum capacity of the weight(s) to be calibrated.

6.5.2.3 The **Metrologist** performs a check of the accuracy of the weight set by:

a. carefully placing a primary standard weight of equal value to the weight being calibrated on the balance pan, and take the balance to zero. Place sensitivity weight on balance and record value.

b. remove primary standard weight and place sensitivity weight on the pan

c. recording the difference in mass between the two weights

d. remove sensitivity weight and replace with primary standard weight, verify zero of the balance. Repeat the above steps as necessary

6.5.2.4 Documenting the Calibration

The following information is recorded on a Calibration Certificate:

- unique identification number
- location
- date calibrated
- date due for re-calibration
- variation in mass from linearity
- tolerance
- calibrators name

6.5.2.5 Weight Labeling

For weights that are calibrated within the specified tolerance, the **Metrologist** completes an appropriate calibration label that contains as a minimum the following:

- M&TE identifier
- date that it was last calibrated
- next calibration due date

6.6 Data Acquisition and Reduction

6.6.1 The **Metrologist** records the required data collected through the implementation of sections 6.5.1 and 6.5.2 on a Calibration Certificate.

6.6.2 The Calibration Certificate is attached to the M&TE / Standard Calibration Record in accordance with QP-12.3.

6.6.3 Any data reduction, if required, is recorded or referenced on the M&TE / Standard Calibration Record.

6.7 Potential Sources of Error and Uncertainty

Potential sources of error and uncertainty may result from human error in recording or reading the data. Repeating individual measurements is the best way to ascertain that no errors are made.

7.0 RECORDS

The following record results from this procedure:

- Calibration Certificate

The Calibration Certificate is forwarded to the M&TE Custodian who will affix the certificate to the M&TE / Standard Calibration Record and process them in accordance with QP-12.3.

8.0 ACCEPTANCE CRITERIA

The ability to calibrate balances and weights within the specified tolerance and proper completion and filing of the records listed in section 7.0 and affixing a calibration sticker to the calibrated item, constitutes the acceptance criteria for this procedure.

9.0 TRAINING

9.1 Prior to conducting work described in section 6.0 of this procedure, personnel performing calibrations, other than verifications or at-each-use calibrations, require training to this procedure.

9.2 Training to this procedure is accomplished by “read only” and is documented in accordance with QP-02.7.

10.0 ATTACHMENTS

Attachment 1: Calibration Certificate (1 page)

Los Alamos
NATIONAL LABORATORY

Standards & Calibration Laboratory
Mail Stop D478, 667-4864

Calibration Certificate

BALANCE File No.

Property No.
Location

Certified:
Expires:

This instrument was calibrated on-site using equipment traceable to national standards. Under normal operating conditions, this item is expected to remain within the stated uncertainty for the duration of calibration interval.

Calibration Results

Instrument Received	Instrument Returned
[ ] In Tolerance	[ ] In tolerance
[ ] Other	[ ] Other

Standard Mass	Balance Reading	
File No.	Pre Calibration	Post Calibration

Tolerance

Calibrated by:

Reviewed by:

Copy to: